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BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST PRODUCTS

FOREST ECONOMICS

RANGE RESEARCH

DEC - 1932









BRANCH OF RESEARCH

December, 1932

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## APPALACHIAN FOREST EXPERIMENT STATION

### Forest Management in North Georgia

Early in December Barrett and party completed examination of a proposed experimental area in the Mulky Creek watershed on the Cherokee National Forest. The stands are principally southern upland hardwood and cove types with some old fields of white pine, yellow pine, and yellow poplar. Approximately half the area has been culled.

Barrett and Bidwell began an analysis of the five quarter-acre white pine release plots on the Cherokee National Forest. Although only one growing season has elapsed since the overwood of defective hardwoods was deadened it is apparent that the white pine understory has responded vigorously to its improved environment.

### Forest Management on the Coastal Plain

Data were compiled for a group of shortleaf pine thinning plots established in 1911 by W. R. Mattoon. Unfortunately there has been such high mortality from insect damage on these plots that the data accrued over nineteen years show very little. It is therefore recommended that these plots be abandoned.

A number of nursery grown loblolly pine seedlings were obtained from the North Carolina state nursery. Several persons each examined these seedlings and counted the ages at the root collar. More care was used than is ordinarily employed in counting ages in field examinations. Though all the seedlings were known to be two years old the counted ages ranged from 1 to 6 years with a mean of 1.6 years and a standard deviation of  $\pm .8$ . This indicates that, unless more accurate methods are used, seedling age counts cannot be relied upon to determine accurately the date of establishment of seedling stands of loblolly pine.

### Forest Influences

A four-inch snowfall occurring on the sixteenth of December offered an opportunity to study runoff from melting snow at the Bent Creek Experimental Forest. The rate of melting appeared to be slightly greater on the raked plot from which all litter has been removed for the past 3 years than on the adjacent untreated area. At the time of the snowfall the soil was saturated from previous rains. During periods of most rapid melting a larger amount of water came off the area under observation as surface runoff directly under the snow. Complete records were taken twice a day during the entire period that snow covered the ground. These will be checked with future snows.

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## CALIFORNIA FOREST EXPERIMENT STATION

### Cover Type Map

During the period August to December, 1932, the Regional Forester assigned two crews, each consisting of a ranger and field assistant, to the Trinity National Forest for cover type mapping and fire-damage appraisal, the former work to be done under the supervision of the Experiment Station, the latter under the Forest Supervisor. Instruction in type mapping and necessary inspection was given by Mr. Jensen of the Experiment Station. The work was organized so that whenever a burn was encountered during the course of type mapping the necessary time out was taken to complete the fire-damage appraisal. Then type mapping was resumed until the next burn was reached. The District Rangers cooperated by packing supplies to the crews. Travel was done on foot, pack stock being used only to move camps. During the four months' period 506,880 acres were mapped and an area of 23,500 acres was covered by the fire-damage survey.

Slow travel because of very rugged topography and because the very few roads and trails were mostly along streams where they were practically useless in mapping, and poor visibility due to few vantage points in the very dense vegetation and to smoke filled atmosphere, made this region probably the most difficult to be mapped to date. Smoke drifting in from logging fires in the Redwood region and from a fire on the Hoopa Indian Reservation which burned uncontrolled most of the summer made mapping impossible for whole days or parts of days. In spite of these difficulties, the cost per acre of the type map was \$0.0038, which does not compare unfavorably with some of our past work.

### Range Research

The public domain report, which was completed December 1, somewhat delayed the starting of the winter's work in the foothills. Talbot devoted most of his time to preparing plans for this work. Anticipated reductions in the temporary plots used last year and the extension of a somewhat modified attack to determine what the foothill vegetation consists of, when and how it grows and what the forage species are, have made it necessary to revise the work plan of last year.

Hormay got underway a taxonomic seedling experiment in the greenhouse. Last winter's work in the foothills was somewhat handicapped by inability to satisfactorily identify, in the early and even late vegetative stages, the annual plants on the temporary plots. In some instances the grasses were quite definitely determined and kept track of for a period of two or three weeks after germination. The seed made identification possible in many cases. After the seed decomposed the culms and leaves had to be used in differentiating the species. The uniform character of these organs made it impossible to recognize the species and identification was again made possible only after the appearance of the inflorescences.



To aid in the field identification during the early stages of growth 32 species of annual plants were sown in the greenhouse and are to be followed from the time of germination until the flowering period. A duplicate set was sown and placed outside the greenhouse to develop under external conditions. Twenty species of grasses and twelve species of herbs are being used. The work was started on a limited scale not only because of the lack of time for handling more species but primarily to test the feasibility of thus obtaining usable key characters in this annual vegetation.

One week was spent by the group in a more detailed examination of the relict areas used in the comparison with outside ranges in the public domain report. Detailed soil and vegetational studies of these areas are expected to go far in enabling us to determine the extent to which the unprotected areas have deteriorated through overgrazing and repeated burning. Transects and plots for this purpose will be established early in January in connection with the relict areas on the Stanislaus and Sierra forests.

### Forest Influences (Erosion and Streamflow)

#### Aeroplane Map

It was necessary to have a map of Y watershed within Devil Canyon from which streamflow is being measured. Owing to the emergency need of surveying silting basins above check dams in the Juncal drainage after the Santa Barbara fire of last September our personnel was not available. The aerial photograph was employed. Where a definite scale for the aerial photograph is known it is possible to determine areas with approximate accuracy. In steep topography, however, scale changes with elevation and introduces errors which may be important where photographs are taken from low altitudes. Corrections of these errors are possible with a special mapping instrument.

Area of Y watershed was, accordingly, determined from a mosaic of aerial photographs taken to scale. Contour trails had been constructed for location of rain gages as has been described in a previous issue of these reports. These trails, showing in aerial photographs, permits location on map of rain gages with sufficient accuracy for determining catch of rainfall. As run-off coefficients are to be calculated currently by plotting quantity of catch and quantity of run-off, this map is of first importance to Sinclair in preparing blue print tracings for calculation of catch of each storm by Dr. Wilm.

### Erosion Studies, Juncal Reservoir Watershed

The field work on the original profile surveys of the Juncal reservoir and check dam basins of tributary drainages has been completed. These check dams were built by the Montecito Water Company to effect the storage of silt and debris above the reservoir should heavy erosion occur as a result of high intensity rains following the burn.



Rowe, of the Station, and field assistants from the Santa Barbara Forest have made profile surveys of the reservoir and check dam basins sufficient to measure the erosion and sedimentation resulting from the burn. These profiles were taken at intervals of 25' or less, at right angles to the stream channels. In addition complete field maps and photographic records were secured of each unit and the adjacent canyon flow to supplement the quantitative work. An intensity rain gage was installed on the Juncal Dam and will be maintained by the Water Company in connection with their weather instruments that results may be tied in to the meteorological factors influencing them. The opportunity here offered to measure a complete case of erosion and sedimentation as a result of fire is unusual and should yield some very instructive data.

### Forestation

First drought, and then heavy snowfall, have thus far prevented field planting in the south, and requests from the Forests for surplus planting stock have been delayed. Of special interest are: (1) the establishment of a grove of Coulter pine on La Cumbre Peak on the Santa Barbara Forest; and (2) the seedspotting and planting of Coulter and Jeffrey pine in connection with the slope fixation work on a highway which traverses a rather open conifer-type north slope. Relict Coulter pines near La Cumbra Peak indicate that this section of the Santa Barbara once supported extensive stands of this fast dwindling species.

Erosion Control - Highways. Dave Ilch and his crew of short-term "slope fixers" were finally driven off the Mill Creek Forest Highway job by snow in mid-December after having completed Section A and made a good start on Section B. Ilch reports that the grain sown in contour furrows during October had begun to germinate before he left the job. A maintenance crew of the B.P.R. completed repair of shoulders and badly settled portions of the road to take care of surface drainage in accordance with Kraebel's plans for safeguarding the slope control work.

Erosion Control - Matilija Burn. The seeding of portions of the big September burn on the Santa Barbara Forest to cover-crop species in a hopeful effort toward erosion control, was completed during November. Theoretically, the best results could be expected from quiet weather, mild temperatures, and a series of gentle rains. Instead, the seeded areas, rainless for many weeks, were whipped by two terrific and prolonged windstorms which lifted off much of the ash and fine surface soil and blew it away in the form of towering dust clouds. These clouds reached altitudes well over 10,000 feet and swept out to sea far beyond the Channel Islands. How much of our mustard and clover seed went out to feed the fish is problematical, but it seems certain that very little of it can be left on the hard windswept subsoil which has been exposed over hundreds of acres of the burn. This must apply to native shrub and herb seeds as well as to that sown by ourselves. Examination revealed that germinating seeds in some places were uncovered and destroyed by this rapid movement of ash and soil.

Experimental plots to check the performance of the various species were completed during December. Other stations facing the problem of quantitative determination of sheet erosion in the field may be interested in



the "erosion pins" devised by Kraebel for this project. These are of wrought iron, 1/8 x 3/4 x 24 inches, pointed at the lower end for driving and notched on one edge eight inches from the square top. The pins are driven at right angles to the slope surface, with the notch on the down-slope edge and flush with the soil surface. Depth of erosion is to be measured with reference to the notch; deposit, with reference to the top of the pin. The tops of the pins are dipped in white paint to a depth of 3 or 4 inches, and one pin in each "spot" (i.e. a group of pins on a selected site where measurements are desired) is numbered with steel dies. In very rocky soil shorter pins, 18 or 20 inches with notch at 6-inch point, are used. A "spot" usually consists of a series of pins set in contour "lines" from ridge-top to foot of slope, each "line" consisting of 3 pins set 10 feet apart on the contour. On long slopes the "lines" are set 50 feet apart, on short slopes closer together, the objective being to set enough pins to make possible a fair estimate of soil movement on the slope surface.

Approximately 1000 of these erosion pins have been set over the Matilija Burn. They were made by a local iron worker at eight cents per pound, or a little less than 5 cents apiece for the 24-inch size.

#### Fire Research

Since the close of the field season the fire group has been engaged in the analysis of the various fire records collected during the past season.

- (1) Some 370,000 1932 lookout visibility observations were examined for reliability and checked for usefulness against the results of the 1931 analysis of similar data. After discarding non-significant data the remainder of the observations have been punched on cards and analyses are now being made on the Hollerith tabulating machine. The state of atmospheric visibility at different times of the day, different seasons of the year, and information on the radius of vision in different directions will result from this analysis.
- (2) Preliminary analysis of suppression squad reports for the experimental forest indicates that the suppression squads reduced fire fighting costs and acreage as well as having a definite preventive effect on incendiary fires.
- (3) Fire statistics, heretofore existing only for the Shasta National Forest as a whole, were segregated for the Experimental Forest area to form a fire atlas.
- (4) The data collected during 1932 on ignition of inflammable cover from automotive sparks have been put into final form. Curry will collaborate with University of California agricultural engineers in the preparation of the final report on this cooperative project.
- (5) Data on performance of lookouts and use of water have been checked for completeness and a partial analysis made.



- (6) The study of binoculars has been completed and the report prepared. An article for the Journal of Forestry has also been prepared and will appear in the February issue.
- (7) Further Boards of Fire Review were attended, where the fire record, suppression action tactics, and strategy were reviewed for the major fires of the forest concerned.

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## CENTRAL STATES FOREST EXPERIMENT STATION

### Regional Travel Log

During the Station's work on the Copeland Report, lack of accurate information regarding the general character of certain portions of our extensive region was most apparent. This is partly due to the fact that much of this information is not now available from any source, and in part to the newness of the Station, the extent of its territory, and the past changes in personnel.

To remedy this situation regarding certain kinds of general information, last fall we started to keep a log of travel over the different highways of the region. This is done most effectively and without delay when two men travel together by automobile. The route of travel is noted, constantly oriented by towns, county lines, streams, etc., and by the mileage on the speedometer. By a system of letters and numbers, a record is kept of such features as topography, amount of forest cover, relative value of land for agriculture, amount of erosion, with brief notes as to character of agriculture, forest types, occurrence of unusual or important species, forest utilization, possible locations of future study plots, and matters of similar value or interest. The chief features are concisely noted, as: E1 = no erosion; E2 = slight erosion; E3 = moderate erosion; E4 = serious erosion; E5 = destructive erosion. Where it can be done without loss of time, additional travel or serious inconvenience, our travel is constantly routed over different roads so that sooner or later we will have covered the entire region. Kuenzel records the data obtained on suitable state maps. In addition to the data collected, which will be of considerable value to us when the next "Copeland Report" or "Extensive Revision" occurs, it has been noted that all of the staff are becoming more observant of conditions and problems because of the requirements of this travel log.

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## INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION

### Forest Management

Fire Damage Study. The major activity of the past season was the intensive study of damage resulting from a 45,000-acre fire in Boise Basin, Idaho in 1931. A ten per cent cruise by the line-plot system covered 5,120 acres of virgin national forest timber land and 5,330 acres of private cut-



over land. Descriptions of each 1/4-acre cruise plot and detailed descriptions of each merchantable tree thereon were recorded in code in the field. These data should not only furnish a reliable basis for an appraisal of the extent and exact form of damage to merchantable timber, reproduction, and soil protection values, but should give some interesting and useful suggestions on fire behavior and the relationship of character of burn to type variations, topography, underbrush, etc. In order to measure further losses in timber and changes in lower vegetation and soil, ten permanent sample plots covering a total of 21 acres and five additional vegetation transects were established. Results will not be available until after machine analysis of the data later this winter.

Connaughton left on October 1 for an assignment of several months to the Washington office. He is supervising the punch-carding and machine compilation of the coded fire cruise data, also the data on 16 ponderosa pine methods of cutting and virgin plots which were given their third remeasurement in 1931.

#### Mc-Ponderosa pine

In order to correlate the results of measurements on permanent cut-over plots with conditions existing over more extensive areas in Idaho, four representative timber sale areas were sampled this fall. A total of 22-1/2 miles of cruise line were run in cutting made from 6 to 25 years ago. Data recorded for each 1/4-acre cruise plot were similar to those for a permanent sample plot, including the tally of a reproduction vegetation transect on each. Degree of stocking all along the cruise line was noted. Increment borings were made on each plot as a check on diameter growth before and after cutting.

Two new permanent methods of cutting plots were established on Moores Creek near Idaho City. They represent a form of "selective logging" induced by the depression that is rather new to private operators in this region, although it is simply the "culling" process that was common in the earlier days in many localities. The remaining stand, although by no means ideal as to composition and spacing, is largely composed of young vigorous trees and give the general aspect of a Forest Service sale area. It is a welcome contrast to the present appearance of many of the areas clear cut by this same operator, and later burned and heavily grazed.

#### Erosion & Streamflow

##### Granitic Soils, Idaho

Two new phases of the erosion and streamflow project on the Boise River watershed were initiated during the past field season which, although widely different, were both aimed at investigating further the peculiar properties and characteristics of the coarse granitic soil which is so common on the forests in central Idaho and which in many places is eroding at a greatly accelerated rate. One of these studies included careful examinations, in place, of the root systems of several typical watershed plants while the other line of work involved the planning, construction and field testing of portable surficial run-off apparatus.



## Root and Soil Studies

The root studies were made on the lower elevations of the Boise Forest during July and August by Pearse, Spence and Klugh. Pits were excavated and the root systems of typical grass, weed and browse plants were carefully dissected, measured and sketched in place. That this task was a tedious one may be surmised from the fact that most of the pits were excavated to depths exceeding 10 feet, the lower two-thirds of which were cut through solid rock.

The studies yielded observations and measurements of the creeping characteristics of the loose structured granite soil on steep slopes. When the root systems were dissected and exposed it was observed that instead of entering the soil on a perpendicular plane the upper foot of the heavy tap roots were sharply bent downhill at angles which in many instances exceeded 45 degrees, this indicating the extent to which the surface soil had moved down the slope since the plants started growth. Trampling by livestock was considered to be the principal cause of the downhill creep since on protected areas of comparable slope, soil movement has been negligible.

The observations and measurements of the exposed root systems very clearly revealed the impressive drought resistant habits of the perennial vegetation. The root systems of the grasses were confined chiefly to the surface foot and were extremely fibrous. The roots of the perennial herbs likewise were largely confined to the surface foot of soil but some, such as Balsamorhiza sagittata, developed tuberlike tap roots capable of piercing the bedrock to depths exceeding 10 feet. Strong and branched tap roots, with restricted fibrous systems near the surface, typified the root habits of the shrubby vegetation which, like the balsamroot, extended deep into bedrock.

## Portable Erosion Apparatus

While the root studies were being made in the field, Craddock remained in headquarters supervising the purchase of materials for the construction and preliminary testing of the portable run-off apparatus. The outfit was completely assembled and moved to Boise late in August where field tests were made for the remainder of the season.

The newly developed apparatus consisted of: (a) a powerful fire pump and 1000 feet of hose mounted on a trailer; (b) an oscillating sprinkler system capable of producing artificial rainfall over an area approximately 30 x 40 feet; (c) metallic baffle plates which, when layed out, make a single plot 6.6 x 33 feet; (d) a metallic collector trough for the bottom of the plot; (e) a silt trap for collecting eroded sediment; (f) a tipping bucket gage for measuring run-off; (g) three tipping bucket rain gages; and (h) a multiple pen instrument for recording simultaneously the intensity of the artificial storms and the rate and amount of run-off. The entire outfit was carried into the field on a 3/4-ton truck and 1/2-ton trailer and could be set up and made ready for operation in one-half day by two men.

Most of September and October was devoted to the calibration of the portable apparatus when set up on a slope of 25 per cent. The capacity of the pump and sprinkler system to produce regulated and uniform applications



of "rainfall" was thoroughly tested and the most desirable pressures and nozzles were ascertained. The silt trap, designed to settle out eroded sediment without interrupting the flow of run-off, proved eminently efficient. A newly designed contact arm on the run-off tipping bucket gage, in which platinum electrical contact points were used, likewise proved highly successful.

The field data have not as yet been compiled. However, preliminary study of the records show that applications of rainfall at intensities of .02 inch per minute resulted in practically no run-off or erosion on slopes of 25 per cent having a 10 per cent cheat grass (*Bromus tectorum*) cover, even when the storm was continued for one hour. When the applications of rainfall were increased to .04 inch per minute for thirty minutes, run-off and erosion were greatly increased. Repeated runs of equal intensities on the same plot revealed, also, that run-off and erosion from dry soil (first run) exceeded the run-off and erosion from the same plot when rewet with the same application of rainfall (second run) by from three to five times.

Although comparative data relative to the erodibility of the soil on contrasting sites were not obtained during this season, the success of the test runs seems to promise abundant data for the next field season. In this connection, next year it is planned to check, under different intensities of rainfall, the run-off and erodibility of such contrasting sites as: sheep driveways and dense grass stands; grass stands and brush land, and burned and unburned areas.

### Floods on Salmon River

Late in October, Craddock examined two watersheds on the Idaho National Forest from which mud and rock flows emerged following heavy rains during July. Because the flooded drainages are situated in a remote and sparsely inhabited section of the "breaks" of Salmon River no damage was done to personal property, although it was estimated each flood brought down not less than 75,000 tons of debris. The floods provoked considerable local and regional interest nevertheless, since one of the deposits seriously threatened the navigability of the Salmon River and because the two canyons were in the center of a 60,000-acre fire which burned that locality in 1931.

The floods were traced to their source where significant evidence was observed relative to the influence of fire on run-off and erosion. The floods originated in the heads of a number of steep tributary gulches on hotly burned patches of lodgepole. On adjacent areas of comparable soil, slope and cover - but unburned, no evidence of excessive run-off could be found. It was concluded that the restricted limits of the torrential rainfall eliminated the possibility of other floods on the remainder of the 60,000-acre burn.



## Range Management

### Summer Range, Great Basin Branch

The regular field work was completed at the Great Basin Branch October 31, and headquarters were transferred to the main office at Ogden.

Besides the annual and biennial remeasurements and re-estimates made in connection with the regular projects, special attention was centered on the influence of frequency in harvesting upon the carbohydrate content of violet wheat grass (Agropyron tenerum), many-flowered brome (Bromus polyanthus) and wild geranium (Geranium viscosissimum). This study is being carried on in cooperation with Dr. E. C. McCarty of Riverside Junior College, Riverside, California, and will continue through 1933 and 1934.

Nineteen segments, each composed of four 1/2-meter plots, comprise the violet wheat grass and many-flowered brome divisions, and 272 staked plants, four in each plot, or 16 in each segment, comprise the wild geranium division. A detailed clipping schedule, based on the different stages of plant development, was planned and carried out for each of these segments. A total of 47 series of clippings were made of violet wheat grass and many-flowered brome, and 36 series of clippings for wild geranium. These clippings were air-dried, weighed, and shipped to Riverside for oven-dry weight determinations.

To correlate with the clipping schedule, height growth and diameter measurements were taken of the plants on each plot, at each clipping, and at 5-day intervals throughout the season. Root and top samples of each species were taken for food march determinations, at 10-day intervals, beginning at the time the winter snow left, and continuing throughout the growing season until the station was closed. A total of 52 root samples and 49 top samples were collected, cleaned, preserved in alcohol, and shipped to Riverside for chemical analyses, along with the roots of plants on plot #1 in each segment, for the three species. Dr. McCarty will make the chemical analyses, and determinations of these samples and clippings during the winter months at Riverside.

It is planned to follow the same procedure, as outlined above, in 1933 and 1934. In 1933 the root samples of plot #2 in each segment, for the three species will be dug and studied. Likewise, plot #3 in each segment will be studied in 1934, leaving plot #4 in each segment, together with the regular check segments, as a check of the 3-year clippings. At the end of this period it is planned to summarize the data and publish it in bulletin form.

### Public Domain Report

During October and November, Forsling, Stewart, Pickford, Hutchings and Deming of the Intermountain Station, together with Standing, Taylor and Hansen of the Regional office worked on the Public Domain report. For the first time actual data on the condition of plant cover under such major groups as grasses, weeds, more valuable browse and inferior browse have been accumulated.



A long series of experimental data from the spring-fall and from the winter ranges of Utah, Nevada, and Idaho show in actual figures, that the decline varies from 50 to 80 per cent. The sagebrush - wheat grass foothills and intermontane valleys of Utah have on the average declined 69 per cent in grazing capacity. In the same type of vegetation on the Snake River Plains the decline was 68 per cent, and in Owyhee County, Idaho, 81 per cent. The most obvious contributing factor to this decline was an almost corresponding decrease in grasses, 64, 75 and 64 per cent, respectively. When the individual plot readings for decline in grazing capacity and decrease of perennial grasses were correlated, the correlation coefficients for Utah and the Snake River Plains were +.87 and +.91. These are some of the largest correlations ever obtained in agricultural work. They indicate unmistakably that the principal problem in rehabilitation of these sagebrush - wheat grass ranges will be in the restoration of grasses.

On the desert shrub ranges of Utah the decline in grazing capacity was 58 per cent, and on similar range in central Nevada 60 per cent. Decrease in grasses seemed to be the principal cause of decline in Nevada with a correlation of +.89, while in western Utah decrease in the more valuable browse gave much higher correlation (+.57) than did decrease in grasses (+.32).

In many areas not only did the more valuable forage plants decline, but the inferior browse greatly increased, in a few areas which were studied, almost entirely replacing the more valuable species.

The Snake River Plains in southern Idaho between Minidoka and Arco furnish an interesting example of a change in type due to man-caused factors. An area of approximately 100,000 acres lying southeast of Arco and averaging 6 to 25 miles from permanent water was found which supports an excellent cover of blue bunch wheat grass, blue grasses and clymus. This area has not been severely injured by overgrazing because stock can use it only when snow is available for water. It was burned over in 1910 and the sagebrush on the whole area was virtually exterminated. However, it was noted on small areas which escaped the 1910 burn that the relict stand of sagebrush is Artemisia tridentata which grew to a height of 3 to 6 feet, almost tree-like in habit, while the invading sage on the area at the present time is Artemisia tripartita, growing not more than 2 feet high. This change of species has no doubt been chiefly influenced by fire, which may explain the presence of large islands of A. tripartita range in the northern portion of the Snake River Plains, which are completely surrounded by the more robust growing A. tridentata.

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## NORTHEASTERN FOREST EXPERIMENT STATION

A series of plots which has been receiving Westveld's attention lately is a set in the Adirondack Mountains dealing with the problem of reducing the cutting cycle in spruce and fir stands being managed for pulpwood production. It is generally acknowledged that one of the most difficult problems in managing spruce and fir stands for successive cuts of pulpwood is the inevitable loss of fir by decay and windfall if the cutting cycle is unduly extended. To prevent this, it is believed that the cycle should not exceed 25 or at the most 30 years. At the same time the period between cuts must be sufficiently long to get an adequate growth on the material left at the time of cutting so as to warrant commercial operations, which in New York and New England are not undertaken for cuts averaging less than two full cords of spruce and fir per acre logged. Five plots aggregating approximately 150 acres comprise the experiment. Three of the plots in the series were given cuttings of different intensities. Westveld has recently finished compiling the data and is working the initial progress report for this study which was made in cooperation with the Finch, Pruyn and Company and the Forestry Department of Cornell University.

Through the courtesy of Professor Ralph C. Hawley and the New Haven Water Company, an opportunity was afforded Stickel to make an extensive study of the effect of deficient precipitation upon the forest vegetation around New Haven, Connecticut. By far, hemlock appears to have suffered the greatest damage. This is particularly true where this species is growing on trap rock dykes. The extent of the drought killing extends all the way from isolated dead trees to stands in which 75 per cent of trees by basal area have died. All degrees of drought damage, from trees with slight stagheadedness to trees having only one large lower branch alive, can be found in the Hemlock type. On many of the dead trees the black shoe-string fungus occurs and also various species of insects, particularly beetles. It is believed that these pests are of a secondary nature in this case, however.

Reineke returned to New Haven after six months in the field, with measurements of some hundred temporary and semi-permanent sample plots in even-aged second-growth northern hardwood stands, together with a type map of some 3,500 acres for the proposed experimental forest in the Green Mountains.

A full season's use of the new increment core holding and shaving device has proven its value for counting and measuring hardwood cores by transmitted light. One or two minor modifications in design are desirable. A description of this instrument will be prepared for publication, and application made for a patent.

Under the heading of "Handy Field Kinks" may be listed:

The use of an A.W. Faber "Pencilaid" sharpener, obtainable through Dietzgen. This sharpener may be left on the pencil at all times (though not so desirable in cold weather). It merely shaves the wood from around the lead, which may be filed to any shape or size desired.



The use of the Cushman and Denison Company's "Perfect Pocket Oiler", a cartridge-shaped oil can for carrying oil for borers and whetstones. This particular oil can is sturdy, of a convenient shape, and does not leak.

The use of a "feeler" drill for cleaning out clogged increment borers. The particular drill used is the "Keen Kutter", 16 x 6/32 inch feeler drill (twist drill, not augur bit) with a square stock. The increment borer handle can be placed over this square stock and thus used for turning the drill. A 5/32 inch drill, if available, would be more satisfactory for the small bore borers, as this would pass through the constricted throat back of the cutting edge, though this is not necessary since any clogged material in the throat can be driven out from the front with a matchstick after the rest of the borer is cleaned out. Naturally the drill should be used only from the handle end of the borer bit, to avoid damage to the cutting edge.

Jensen attended a meeting at Durham, New Hampshire, sponsored by the New Hampshire University Forestry Department. The discussion at the meeting centered around the need for a complete survey of the raw material requirements of the wood-using industries of New England. The consensus of opinion seemed to be that the best way to handle this project would be the assignment of one man or possibly a man in each state, to collect the data, with some one organization to act as the coordinating agency. The results of this survey should take the form of a gazetteer, listing the wood-using industries of the region together with information as to the normal requirements (species, quality, and quantity) of each plant. The woods operators would also be listed, together with information as to the quantity and type of material they would be in a position to supply. In this way it is hoped to bring together the two groups and recapture for New England operators a part of the market lost to the western lumberman.

MacAloney reports that the manuscript entitled "Additional Notes on the Improvement of Weeviled Pine Plantations in New England", is now in galley proof. It has been edited and returned to the Connecticut Forest and Park Association for publication. Some additional reference work has been done in connection with the relation of weather conditions to white pine weevil attack and this report will be prepared during January.

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NORTHERN ROCKY MOUNTAIN FOREST & RANGE  
EXPERIMENT STATION

Silviculture

The Station has had about a hundred seed traps in place in the western white pine type for several years. These are located in series in old and young stands and under different conditions of cutting. Compilation of records resulting from trap collections at two-week intervals during the fall is adding materially to knowledge of time, quantity, and character of seed dissemination. An example is afforded by the records from two sets of traps in an 80-year old stand and a virgin stand at the Priest River Station. The data represent the results from the 1931 seed crop, which was rated fair



to good for cedar and scant for all other species. There were sixteen traps in each series.

Seed Fall Per Acre All Species in 1931  
Number of Seed Per Acre

<u>Period</u>	<u>Virgin Stand</u>	<u>80-Year old Stand</u>
August 1-31*	62,000	3,250
September 1-15	76,000	2,000
September 16-30	69,748	10,500
October 1-15	91,748	2,000
October 16-31	83,468	None
November 1 - May 31 (1932)	875,732	None
Total	1,258,696	17,750

\*Includes also any seed which may have fallen from old cones since the spring clearance of seed traps in May.

Proportion of Seed Fall by Species  
Per Cent of Total

<u>Period</u>	<u>Virgin Stand</u>					<u>80-Year old Stand</u>					All Species
	Ced.	Hem.	Lar.	Wh.P.	Others	Ced.	Hem.	Lar.	Wh.P.	Others	
August 1-31	70	15	4	11	0	0	0	77	0	23	100
September 1-15	86	11	1	1	1	25	13	50	0	12	100
" 16-30	70	19	9	1	1	43	16	33	0	8	100
October 1-15	66	29	4.7	0.3	0	75	0	25	0	0	100
October 16-31	80	17	3	0.0	0	0	0	0	0	0	100
Nov. 1 - May 31	77	20	2	0.7	0.3	0	0	0	0	0	100
Total	76	20	2.5	1.3	0.2	37	11	43	0	9	100

As an appreciable share of the crop of large-sized seed is harvested by squirrels before the cones open, the seed traps naturally do not yield a measure of total seed production, but rather of seed dissemination. In this particular case, for example, it is known that the 80-year old stand produced a few white pine cones in 1931, although the traps caught no white pine seed whatever.

It may be mentioned that the Station has both seed traps and reproduction quadrats on most of its methods of cutting plots and is thus able to correlate amount and season of seed dissemination with the time and amount of germinating reproduction. Distance of effective seed dissemination is also a factor measured by the traps.

## Fire Protection

Mr. Rene LaRocque, detailed by the Regional Office to the lightning study, has completed the coding of the lightning storm reports for 1932 and has prepared an eight year summary showing the probability of occurrence of storms and of safe or dangerous storms by 10-day periods for each forest and for the Region.

A compilation has been started to determine the index figure for each forest and the Region representing the rating of the character of the 1932 fire season. This rating will be based on daily measurements at some fifteen to twenty stations of the six factors of fire danger included by the danger meter and integrated by the Supervisors to represent conditions on each forest. This will be the first time that it has been possible to produce a rating for the Region based on well distributed measurements, each weighted in accordance with the area represented.

Because we operate a meteorological station the public frequently calls upon us with strange requests, such as: "Is it going to rain tomorrow afternoon so that I shall have to postpone my lawn fete?" and, "How cold is it today? I wanted to know whether it was too cold to take the baby out." Such inquiries are easily answered or dodged, but when our bustling Purchasing Agent and Warehouse Operator, O. C. Bradeen, called us up a few days ago he was not to be dodged. His questions were: (1) How dry should an axe handle be at time of hanging in order to prevent later shrinking and loosening? (2) Where and how can some 500 dozen handles be dried to that moisture content in the Missoula and Spokane warehouses? (3) If the handles are well fitted at minimum moisture contents, how can they be kept from swelling later, due to wetting, so that they spring the eye or crush the fibers? An answer to (1) was indicated by our wood cylinders as 8%, if firefighters would always drop their axes in the shade, but nearer 5% if they are likely to leave them in the sun. An answer to (2) was partially produced by a humidity and temperature survey of the Missoula and Spokane warehouses. The answer to (3) is still desired, as the connection with fire research is too weak to deliver the goods.

## Requirements Phase of Forest Survey

Analysis of Missoula building permits shows a relatively high proportion of all wood type construction in dwellings. For all dwellings constructed in this city from 1912 to 1931, inclusive, 86.9 per cent were all wood, 7.5 per cent wood frame with brick veneer, 5.6 per cent wood frame and stucco and 1 per cent fire proof.

## Logging and Milling

Compilation of the data for the Ohio Match Western White Pine Selective Logging Study is about two-thirds completed. Conversion values by tree and log sizes are being computed in two ways. First, when the trees are sawed to obtain the maximum yield of match plank; second, when match plank is converted to commercial lumber grades and the usual commercial lumber selling value allocated to these grades. All match plank was valued at



\$28.00 per M, while the commercial grades carried an average value of \$30.10 per M. A considerable amount of commercial, principally 4/4 stock and 8 and 10/4 reject match plank (not over 25%), is always developed in sawing for match plank. Based on the above prices, our findings to date indicate that study timber was worth from \$2.00 to \$4.00 more per M lumber tally when graded and priced on a commercial lumber basis, than when graded and priced as match plank.

### Range Management

On December 1 the sixty experimental cows were weighed and moved from six summer to winter pastures at Ft. Keogh. Weight curves took a decided drop after the unusually severe October storm, but the trend was slightly upward again through November, except in the case of the animals from two pastures. One of these was a pasture designed for overgrazing; the other was a pasture designed to provide surplus feed. However the density of the forage on this pasture was low, but the quality was good and a substantial amount of sparse forage remained on December 1. Weight losses may have been due to the excess effort and time required to graze enough sparse forage, as well as from an actual deficiency. This point will receive further attention.

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## PACIFIC NORTHWEST FOREST EXPERIMENT STATION

### Forest Insurance Study - Ponderosa Pine Region

With the help of one assistant the office computation of reproduction damage on the areas examined last summer was completed in December.

Of the areas covered by the summer's work on both private and national forest lands, 29,410 acres carried a measurable stand of reproduction. This acreage was divided into two classes - reproduction under merchantable timber, and reproduction on areas from which the merchantable timber had been removed. There were 21,755 acres of the former and 7,655 acres of the latter.

Prior to the fires the first class averaged to be 53.2 per cent stocked with reproduction, using the stocked quadrat method, all species included; the second class was 47.7 per cent stocked. After the fires the first class was 5.6 per cent stocked and the second class was 9.7 per cent stocked.

### Section of Forest Products

Douglas Fir Mill Scale Studies - The Hollerith cards for the Douglas fir mill scale studies were sorted and tabulations made at the University of California under the personal direction of Lodewick. The final compilation and report preparation is now under way.

Motor Truck Logging - Rapraeger has completed the first draft of the motor truck log hauling report, which should be submitted for publication next month.

### Mensuration

Progress reports were finished on three sets of permanent sample plots in second growth Douglas fir and certain parts of the statistics were used in a combined report on the correlation between degree of stocking and rate of change in stocking with advance in age. Some of the major tentative conclusions reached in this paper were anticipated in the monthly report for November. Beyond the fact that understocked stands advance and overstocked stands retreat in stocking, it is shown that true normality is probably 10 to 15 per cent higher than indicated by our present yield tables, a fact which should be kept in mind when comparisons between the potential yields of various species are made.

### Fire Studies

During the month McArdle practically completed the visibility studies for the past field season. Outstanding among the results obtained are:

The development of a new eye test for lookouts, which appears to give more reliable measurements of a lookout's ability to detect small smoke columns than tests used heretofore.

A scientifically sound and accurate method of measuring air transparency was devised, using photo-electric cells to measure the amount of light absorbed by dust particles in columns of air more than a mile long. So far as is known this is the only simple and rapid method so far developed anywhere.

Still simpler methods for measuring air transparency, suitable for use by lookouts, was invented but has not yet been completely calibrated in terms of the standard photo-electric apparatus. One of these methods utilizes a "haze meter" which appears to offer outstanding possibilities.

Field tests with artificially produced smoke columns appear to prove:

Within a circle having a radius of 15 miles, small columns of smoke are just as visible when the observer faces the sun as when he has the sun at his back.

The extra effort required in searching for smoke columns in the quadrant toward the sun might be reduced by having observers use densely smoked glasses.

Small changes in atmospheric transparency when the air is clear (e.g., the development of a light haze) reduce the effective area of fire detection coverage far more than has been realized and very much more than similar changes in transparency after the air becomes very smoky. This suggests that the detection system ordinarily may not be augmented as soon as it should.



Small changes in the size of smoke columns affect the radius of visibility more when the air is clear than when the transparency is low. This means that in smoky weather fires are likely to be large before look-outs can detect them.

Further experiments must be made before positive conclusions can be drawn, but it appears that the following maximum ranges of visibility are safe approximations for small fires: in clear weather, 15 miles; in "average worst" summer weather, 9 miles.

Matthews nearly completed the computations of check cruises of recent national forest fires necessary for the fire depletion phase of the forest survey.

### Silviculture

During December Isaac completed the revision of his report "Seedling Establishment in Relation to Environmental Factors on Logged-off Land in the Douglas Fir Region". The report covers 5 years of meteorological and cover records correlated with seedling behavior. It shows surprisingly heavy losses from the known major causes like heat and drought, and in addition great losses from unsuspected causes, such as mice and frost. The study very clearly indicates that if better restocking is to be obtained in a shorter period of time, a better condition for survival must be provided than results from clear cutting and heavy broadcast burning.

### Douglas Fir Heredity

Morris has been engaged in compiling the accumulative data on the Douglas fir pedigreed plantations. The average height of progeny from each parent tree has been computed for the five duplicate plantations located in various parts of the Douglas fir region. The data are based on a total of 11,300 young trees. Each parent has both 15 and 16 year old planted offspring. The 120 parent trees represent 28 different locality and growing conditions.

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## SOUTHERN FOREST EXPERIMENT STATION

### Management

Wahlenberg and Ineson made the semi-annual examination of the reproduction quadrats at McNeill, Miss., and report that the longleaf seedlings from the 1924 seed crop have not yet started height growth.

### Forestation

Of the total of 513 State-supervised plantations only 40 per cent have a survival of 66 per cent or better. The plantations visited seemed to be peculiarly subject to insect attack, and the nursery has been invaded by *Toumeyella* scale.

## Protection - Fire

At Bogalusa, La., Pessin made a reexamination of an area of longleaf seedlings of the 1920 seed crop which had been protected from fire for 12 years but which burned over on July 26, 1932. The results are as follows:

<u>Height Class</u>	<u>Per cent survival</u>
0-3 inches	61
3-6 "	50
6-12 "	56
1-2 feet	6
2-4 "	9
4-6 "	78
6-8 "	100
8-12 "	100
over 12 feet	100

A remeasurement of the loblolly pine plantations of 1924 which burned over in March, 1932, showed the following survival:

<u>Height class</u>	<u>Per cent survival</u>
3 feet	3
4 "	12
5 "	40
6 "	40
7 "	55
8 "	43
9 "	61
10 "	73
11 "	70
12 "	90
13 and over	100

Of the loblolly pine trees that survived, the growth during the growing season of 1932 was only from one-third to one-half as great in both diameter and height as it was on the unburned plantation.

The Lake City, Fla., office completed analysis of fire damage data obtained on an extensive survey of north Florida, southeast Georgia, and southern South Carolina. Severe fires occurred in these States following the drought of 1932. Several points brought out in the analysis follow:

1. A high correlation (-96) was found between diameter and mortality following fire in uniform, even-aged, second-growth longleaf pine. Mortality decreased 16 per cent for each inch increase in diameter (breast-height) in a stand ranging in diameter from 1 to 8 inches.

2. It was found that if the average mortality from a fire in longleaf pine was 40 per cent or more, by number of trees, trees of all diameters were killed. If the mortality was from 1 to 20 per cent, the upper diameter



limit from which trees were killed was 2 inches; and if the mortality was from 20 to 40 per cent, the upper diameter limit was 4 inches.

3. Longleaf pine stands in which fires caused greater than an average of 30 per cent mortality showed reproduction to be more fire-resistant than trees of the 1-inch class.

4. The 2-inch trees in slash pine stands showed the lowest mortality per cent.

5. All slash pine reproduction was killed in fires in which the average mortality was greater than 30 per cent.

6. Increase in stand density was found correlated with increase in mortality.

7. Ips beetles were found active and were killing a large number of trees several months following a severe fire.

#### Naval Stores

Wyman reports that there was evidence that during 1932 back-boxed trees had suffered more severely from dry facing than trees with only one face. It also seemed to be true that the trees which were rested until mid-summer of 1932, after which 15 or 16 streaks were placed on them, came through in good shape.

#### Red Gum Growth and Yield

On a scouting trip through the holdings of the Hyde Lumber Co., an area was found from which this company was logging oaks, cottonwood, and sap gum in an old-field stand that was between 60 and 70 years old, with some trees as large as 30 inches in diameter at breast height.

During the course of this study it was found that several species of trees and shrubs are prevalent on the better sites which were almost entirely absent on the poorer sites. Among the most important of these were box elder (Acer negundo), elderberry (Sambucus canadensis), pokeweed (Phytolacca decandra), pawpaw (Asimina triloba), and sassafras (Sassafras officinale). Likewise, palmetto was found to be an indicator of medium or poor site.

#### Financial Aspects of Private Forestry

The Financial Aspects staff spent the month working on the several County and Case studies now in process of compilation and analysis. Reynolds found that in growth determination for shortleaf and loblolly pine, when volumes are expressed in board feet, the error present by not considering bark growth as well as wood growth is approximately 10 per cent for the 6-inch diameter class. This percentage of error decreases by diameter classes to approximately 1.5 per cent for the 18-inch class. Above the 18-inch class no error is involved due to the fact that the bark drops off as formed.

## Forest Survey

An analysis of our upland hardwood stand tables showed a large tally of rotten and sound culls. The sound culls are trees which due to form, such as crook, limbiness, or shortness of bole, are not suitable even for tie or timber material. The rotten culls are trees which, due to rot, do not contain a merchantable log.

On the basis of total volume in trees of merchantable size (13 inches and over), the culls make up about 20.6 per cent of the total, of which 10.4 per cent is due to rotten cull and 10.2 per cent is due to sound cull trees. For all trees more than 25 inches in diameter, the cull material accounts for 42.7 per cent of the total volume. This can be explained by the fact that most of the larger trees in this unit are remnant or residual trees left after logging. Such material has been passed over by successive logging operations and is not a part of the timber resource. This cull material in the form of wolf trees tends to reduce the possible net growth.

## Forest Pathology

Verrall and Siggers made an extensive survey of the brown-spot needle blight of longleaf pine seedlings through Alabama, Georgia, and northern Florida to determine the relative prevalence of the disease and the relation the disease bears to the time elapsing since burning.

## Forest Products Pathology

The pine and hardwood lumber-dipping tests were completed. The Dow phenol compounds gave somewhat better results than the organic mercury compounds, particularly on pine. Considerable mold occurrence was encountered in the pine lumber given the organic mercury treatments, while little or no mold occurred in the case of the chlorinated phenol treatments.

After 90 days of seasoning under conditions conducive to the development of stain, mold, and decay, the green pine poles given one of several dip and spray treatments at Brewton, Ala., are bright and apparently free from decay. Untreated control poles under identical conditions are heavily stained and molded and no doubt contain decay fungi. On the strength of the results obtained to date, the company is planning the installation of pole-dipping and spraying equipment. Thus pre-treatment with water solutions of certain chemicals will become a part of their regular practice.

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## RESEARCH ACTIVITIES - R-2

The year 1932 was the second driest of the 22 years since 1910 for which records are available at the Fremont Station. The annual deficit was 24%, which followed a 12% deficit in 1931. As a result, the situation in the Pikes Peak watershed region has become alarming from the standpoint of the domestic water supply. The timber stand also is in poor condition, which is to be expected in view of the 31% and 27% growing season precipita-



tion deficits for 1931 and 1932. The phenomenon of two dry years coming in succession has occurred more than once in the past, but no two successive growing seasons in the past have experienced such a shortage of precipitation as have those of the past two years. This constitutes the real crisis.

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## MANUSCRIPTS

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Observations on Drought Injury in Hemlock Stands on the Trap Rock Ridges near New Haven, Conn. P. W. Stickel.

### Pacific Northwest

Approach of Abnormally Stocked Forest Stands of Douglas Fir to Normal Condition, W. H. Meyer. (For Jour. of For.)

Discussion on "Papers on Natural Resources and Land Use" at 1932 Meeting of Washington State Forestry Conference. H. J. Andrews.

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The Timber Problem in Conservation. Sinclair A. Wilson. (Delivered at meeting of Soc. of Am. For.)

Seedling Establishment in Relation to Environmental Factors on Logged-off Land in the Douglas fir Region. Leo A. Isaac. (Five-year report.)

The Range of Visibility of Smoke from Small Fires. R. E. McArdle and G. M. Byram. (Progress Report.)

A New Eye Test for Lookouts. R. E. McArdle and G. M. Byram.

Measuring Air Transparency with the Haze Meter. R. E. McArdle and G. M. Byram.

Memorandum Report on Natural Target Visibility Study. R. E. McArdle.

Memorandum Report on Smoke Tests Made in 1931 in Connection with Range Visibility Study. R. E. McArdle.

Revised Working Plan for Douglas Fir Slash Disposal Study. R. E. McArdle.

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Case Study Demonstrating the Industrial Opportunity for Private Forestry in the Pacific Northwest. A. J. F. Brandstrom.

Memorandum: Cutting Depletion Phase of Forest Survey. H. M. Johnson.

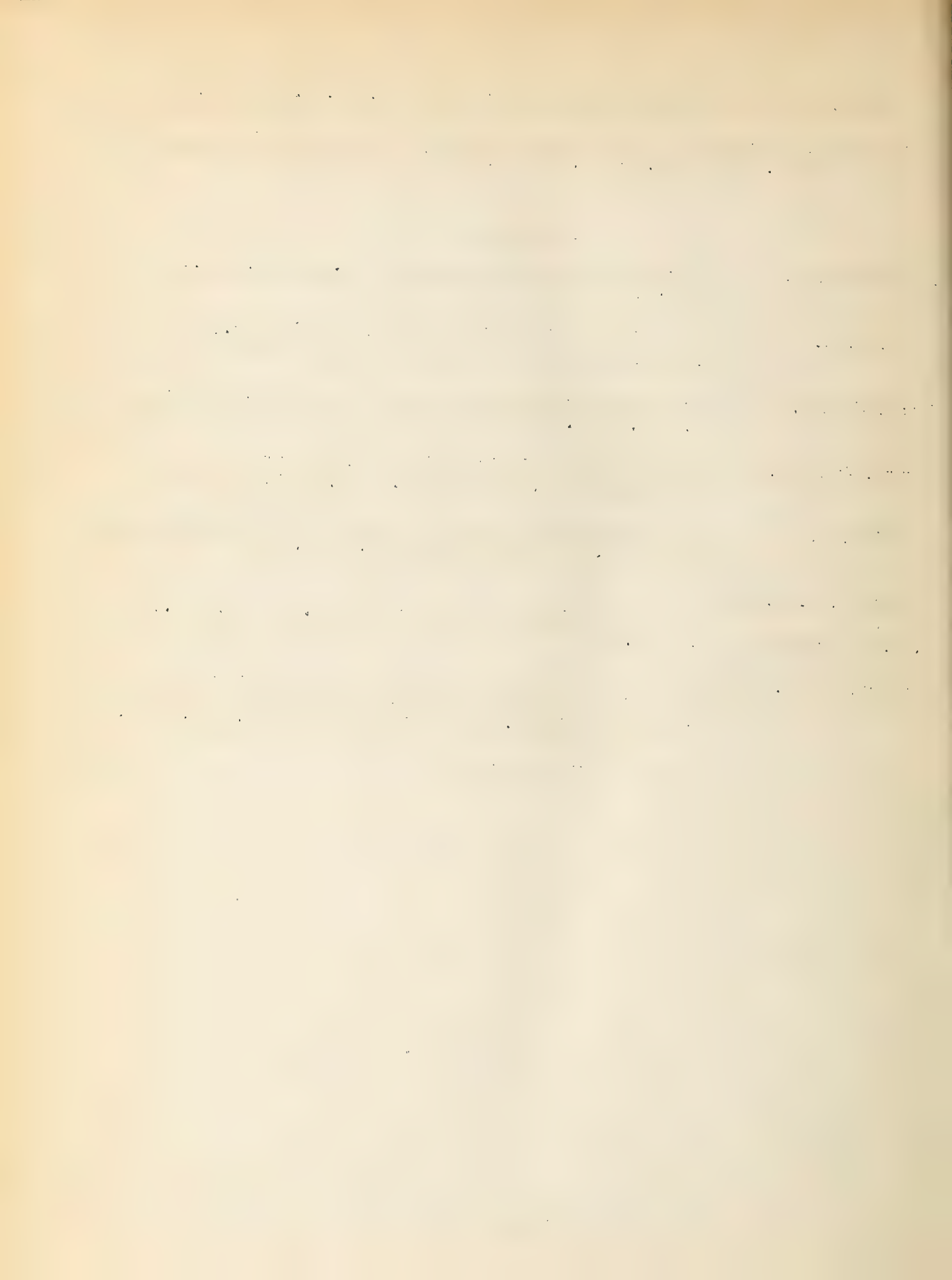
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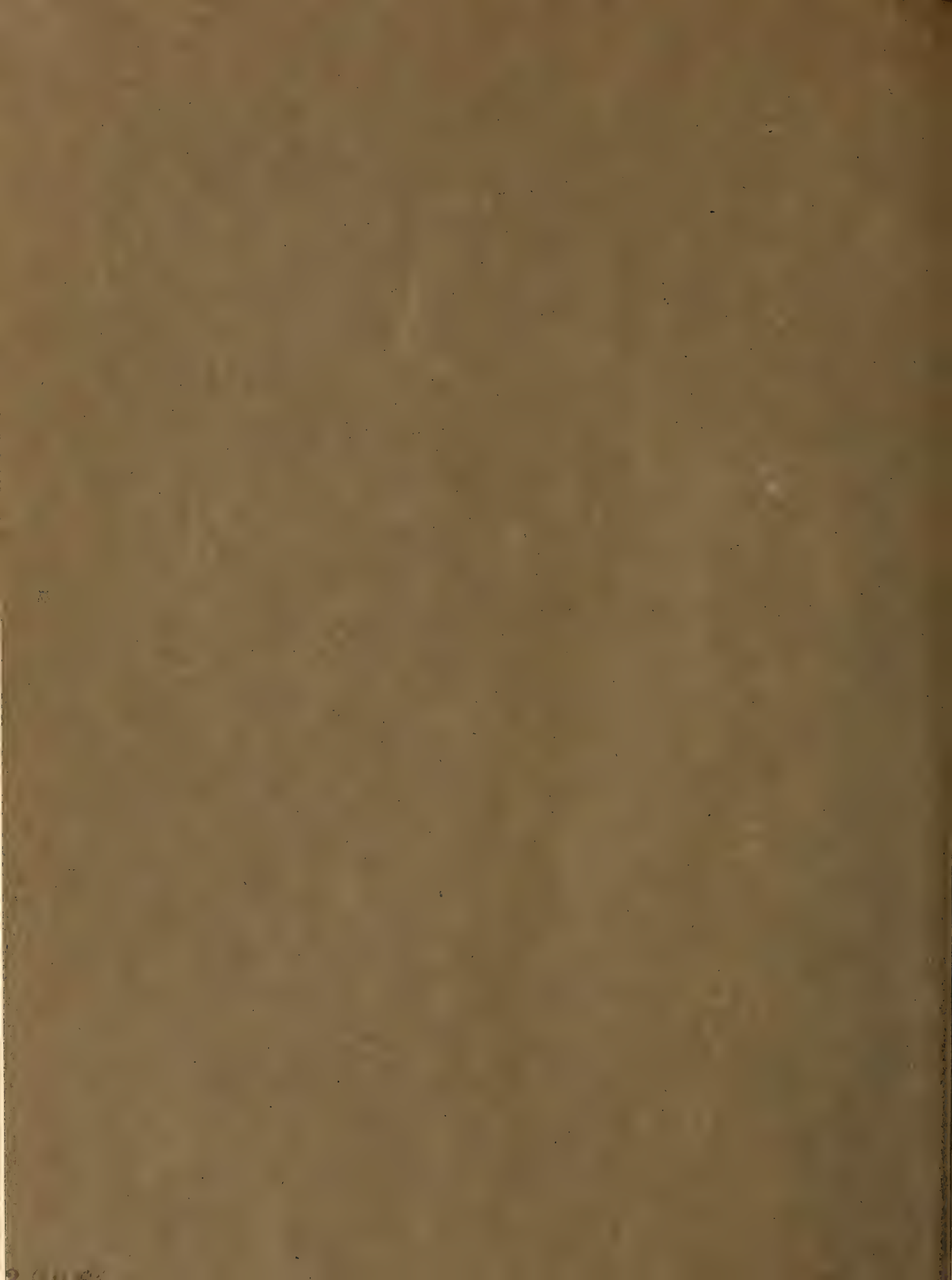
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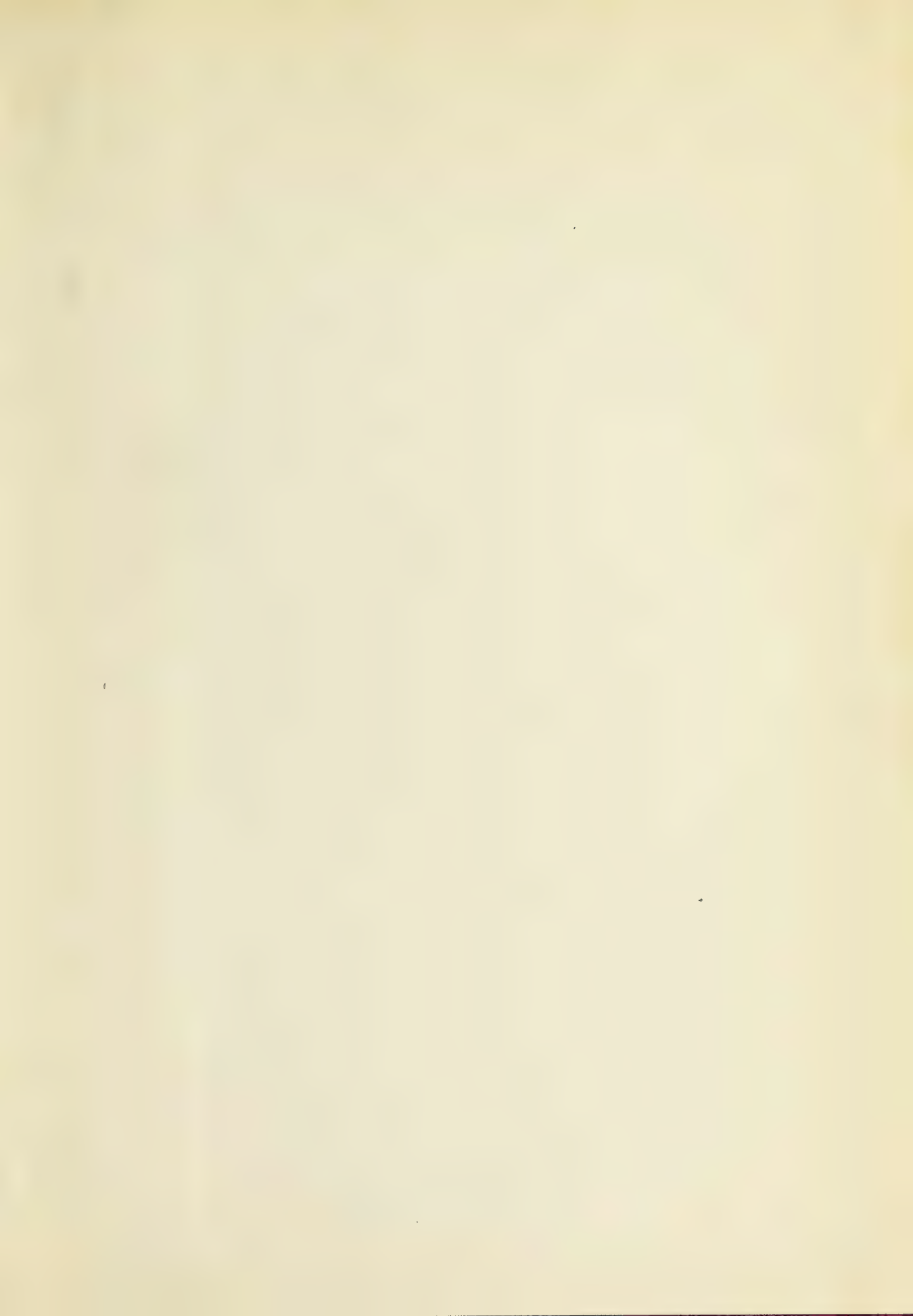




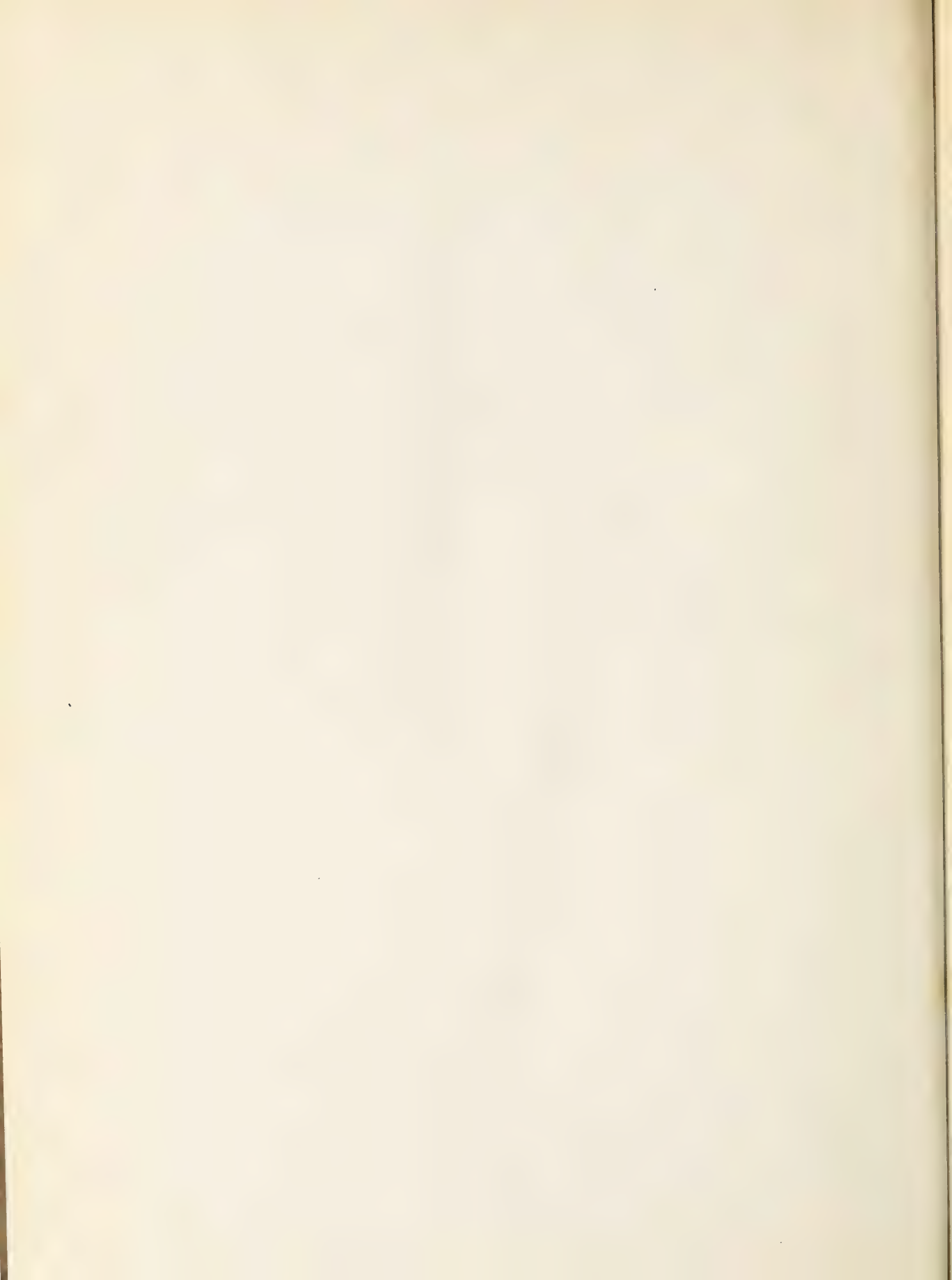
















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